

The public utility commission in California is known as the Railroad Commission of the State of California. It has authority over hydroelectric power companies, and also over those water distributing companies which are classed as public utilities. Recognizing the gravity of the situation, and in the hope of preventing costly litigation, the railroad commission has organized a body called the Emergency Water Conservation Conference, which includes in its membership representatives of all the State and Federal agencies concerned with the water problem. It includes representatives of the State railroad commission, State water commission, State department of agriculture, State university, State department of engineering, United States Geological Survey, United States Weather Bureau, United States Bureau of Irrigation Investigations, and the United States Army. This conference held many meetings during March and April. Through an educational campaign the public was informed of the pending water shortage, and urgent recommendations were made for the conservation of water.

The larger water users of the Sacramento Valley voluntarily signed an agreement turning over to the conference authority to control and to apportion the available water of that valley during the summer of 1920. These water users voluntarily assessed themselves on an acreage basis an amount which will give the conference about \$30,000 for administrative purposes in dealing with the water problem. As the hydroelectric power will be insufficient for pumping irrigation water, steam pumping plants are at present being installed in many places in the valley. Mr. Paul Bailey, chief engineer, has been engaged by the conference to act as water administrator, and he will spend a large portion of the summer in the field in connection with his duties.

During the summer of 1919 the Sacramento River reached unprecedented low stages. Navigation, which under normal conditions is possible to Red Bluff, was possible only as far as the city of Sacramento. While the Sacramento River is usually at a high stage during the spring months, at this writing (Apr. 13.) it is so low that it appears that the river will establish a new low record stage before the close of the summer. Certain results of the recent low stages of the river are of peculiar interest.

Under normal conditions, the flow in the delta region, just before the river enters San Francisco Bay, is sufficient to cause the water to remain fresh. However, during the recent low water the flow has been so scanty that the salt water from San Francisco Bay has encroached upon the rich agricultural lands of the delta region, and irreparable harm will follow if the salt water remains long enough to saturate the lands adjacent.

Furthermore, certain industries, including the California-Hawaiian Sugar & Refining Co. and the Southern Pacific Railroad, have built piers at various places in the delta region. These piers rest on wooden piles. In designing these structures it was expected that only fresh water would ever surround these. Salt water would be destructive to these untreated piles if the contact were of long duration. At present the salt water is steadily passing farther and farther up the delta, apparently to remain until the next rainy season. If that occurs, many thousands of dollars of damage will result. Property owners in the delta region have gone to the courts of law and are seeking an injunction against the taking of water from the upper Sacramento River while the low water continues in the delta region. The conference, referred to above, hopes to save the various interests costly and

long-drawn out litigation. The importance of rainfall, and the need of wide margins of safety in engineering projects dependent upon it are emphasized in the present situation.

#### "SNOWBALL" HAIL AT TOPEKA, KANS., MARCH 3, 1920.

By S. D. FLORA, Meteorologist.

[Weather Bureau Office, Topeka, Kans., Mar. 12, 1920.]

Thunderstorms occurred in connection with the passage of an area of low pressure which was central over Dodge City on the morning of the 3d and over St. Louis on the morning of the 4th.

The wind at Topeka during the afternoon blew first from the southeast, then from the east, and later from the northeast at the rate of 8 to 12 miles an hour, with the barometer falling steadily and rather rapidly, occasional sprinkles of rain, the temperatures ranging from 46° to 50° F.

A single loud peal of thunder, the first in several months time, was heard at 4:48 p. m., coming from a dark, threatening cloud in the western sky. At 5:08 p. m. the wind shifted abruptly from northeast to northwest and within 10 minutes had increased to 25 miles an hour; and simultaneously the barometer began a rapid rise. The western sky in the meantime became darker and more threatening. Occasional sprinkles of rain continued to fall. The temperature which was 49° when the wind first shifted, fell rapidly, reaching 34° by 6 p. m.

At 6:27 p. m., following several violent peals of thunder, there suddenly began a fall of what first seemed to be small balls of ice from one-fourth to one-half inch in diameter, which almost covered the ground within the space of 60 seconds. This fall lasted for about 5 minutes. The balls striking objects with the velocity of hail stones and seldom breaking from the impact. Rain was mixed with them somewhat, as it is often mixed with sleet, and, as the temperature was quite close to freezing, the rain froze to limbs of trees and wires catching the balls as they fell so that in a short time trolley wires and telephone wires were soon coated with this mixture of ice and snow, or ice balls, making it very difficult to move street cars and causing much trouble with telegraph and long-distance telephone lines by bringing them down.

A close examination of these ice or snow balls showed them to resemble nothing so much in structure as the compact snow balls—the ones as large as base balls—that boys often make from slushy snow by squeezing and working it. They were fully as hard as hail stones, but lacked the concentric layers of the latter. Within a few minutes after they began to fall the ground was white from them and some that fell on sheltered parts of paved streets and roofs were still there the next morning, frozen in with the ice formed by the rain and sleet, which fell at intervals throughout the rest of the evening.

#### DISCUSSION.

The snowballs, obviously, were hailstones formed by the usual back and forth excursions between higher and lower levels. In the present case, however, the lower levels contained, presumably, only partially melted snow, or snow and rain mixed, and not rain alone. Hailstones formed under these conditions doubtless would be compact, but would not show well-defined alternate layers of clear ice and compact snow—only more or less compact snow throughout. Rain unmixed with snow seems essential to the formation of the layers of clear ice.—*W. J. Humphreys.*